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Editorial

It is awkward to wake up as one of the lecturers of a summer school on logic, wondering whether you actually like logic at all. Unfortunately this is what happened to me a week ago, when lecturing at the European Summer School on Logic, Language and Information; see the short resume in this edition.

I was lucky to be guest-editing The Reasoner at that point, because this allowed me to challenge my feeling that logic concerns pointless figments of the imagination. And indeed, within a week I had reasoned myself back into a much more stimulating relation to logic.

I was greatly helped in this regard by a course from Michiel van Lambalgen, professor of logic and cognitive science at the University of Amsterdam. The course description looked totally outrageous, and I was not disappointed. Van Lambalgen argues, convincingly I think,

that from the ashes of old-school logic in cognitive science, symbolic representation of reasoning is once again spreading its wings. More on this phoenix of logic can be found in the interview.

This Reasoner also features a piece by Marian Counihan, one of Van Lambalgen's PhD students, who will defend her dissertation 'Looking for logic in all the wrong places' this October. She calls into question the seeming simplicity of the first Aristotelian syllogism, thereby illustrating a point that is also discussed in the interview: in getting from a set reasoning task to a piece of logic, the reasoner has to traverse a whole world of interpretative issues.

Apart from that, my task was made very easy indeed. Guest-editing The Reasoner is quite possibly the most easy and relaxed of all guest-editing. Lots of thanks go to the the managing editors of The Reasoner, Federica Russo and Jon Williamson, for asking me to guest-edit, and for most of the work, really.

Jan-Willem Romeijn

Philosophy, Groningen

§2

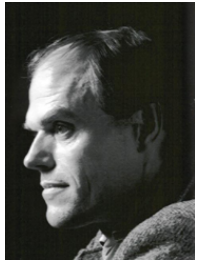
Features

Interview with Michiel van Lambalgen

Michiel van Lambalgen is professor of logic and cognitive science at the Philosophy Department of the University of Amsterdam. In the 1980s and early 90s he was active in mathematical logic, publishing mainly on the notion of randomness. At the turn of the millenium he switched to cognitive science. He is currently involved in two research programmes, 'Logic meets Psychology: nonmonotonicity', and 'Reasoning and the

Brain'.

I meet van Lambalgen just after his last lecture at ESSLLI 2008 (Hamburg), where over the course of 5 days he has developed a coherent picture of language use, brain function, planning and reasoning, with logic right at the centre. He has just explained that Attention Deficit Hyperactivity Disorder (ADHD) can be seen as a problem with goal maintainance in complex tasks. Within van Lambalgen's picture, goal maintainance is tied up with the use of tense in discourse. And indeed, experiments confirm that children with ADHD have more trouble with using tense in recounting a story.



I ask my first question, on the methodology of this enterprise, when still in class, but we continue discussion over a mint tea next to one of Hamburg's cinemas.

Jan Willem Romeijn. I want to discuss your most recent book, 'Human Reasoning and Cognitive Science' (MIT 2008), written with Keith Stenning. But I would rather start at the other temporal end of your research. Can you tell about the intellectual history of this book?

Michiel van Lambalgen. In the 80's I did research on randomness, but after some time I felt the subject was too abstract. So in the 90's I moved into the field of artificial intelligence. One can really not sink much lower than that... However, from artificial intelligence I did pick up a methodology for studying cognition: the work of David Marr, who separates out three related levels of cognition (information, algorithm, and implementation) with an increasingly prominent role for the constraints imposed by the material brain. The way in which these levels relate determines how biology imposes constraints on cognition. It then struck me that logical systems can be quite good for a formal characterisation of the informational level of cognitive processes. At this time I also developed an interest in the semantics of natural language, viewed as informative about human cognition, and in the psychology of rea-

soning. Logical formalisations of the informational level has been quite fruitful in these fields.

JWR. And what did you find in the psychology of reasoning?

MvL. I was surprised at the complete lack of knowledge of logic among psychologists of reasoning. After easily dismissing classical logic as the logic of reasoning because test results seemed to show that subjects do not reason according to classical logic, they would produce half-baked systems of their own and take them as the algorithms. The mistake of much of the psychology of reasoning, e.g., research on Wason's task, is that it takes the cognitive task construal at the informational level for granted, and immediately focuses on the algorithmic level. It leads to a false picture of what mind and/or brain are doing when engaging in the task. Subjects do not look for an answer given a task setup, rather they are trying to get clear what the task is in the first place.

JWR. Then how did you end up writing a book with Keith Stenning, who is after all a psychologist of reasoning?

MvL. Obviously Keith is not among these erring psychologists. I spent a very fruitful sabbatical with him at Edinburgh University in 1999. We started considering a much wider array of possible logics for fitting the experimental findings, and crucially, we considered the engagement of subjects in the reasoning tasks not as inference within the task, but rather as their attempt to figure out what the task is. In our view, subjects were 'reasoning towards an interpretation', trying to complete a coherent picture from the task setup, and not reasoning from a fixed interpretation towards an answer within the task.

JWR. Is this the central claim of your book?

MvL. This is an important claim in the book, but there is more. We think that logic has been discarded too easily as part of cognitive science, due to the combined pressures of connectionism, Bayesianism and the presumed results of the psychology of reasoning; and we try to set that straight. But we also want to relate the psychology of reasoning to other psychological disciplines, opening up the ghetto that it is at the moment. This is why we include research on clinical psychology,

for example autism. Based on a logical model of so-called executive function together with data on autistic dysfunctions in the executive domain, we could predict deviant reasoning patterns in autists; and these predictions have been confirmed.

JWR. How does your other book, 'The Proper Treatment of Events' (Blackwell, 2004) written together with Fritz Hamm, fit into this picture?

MvL. Hamm and I describe how our understanding of ordinary discourse can be related to a semantics for natural language that uses Logic Programming (LP) and a particular set of predicates for capturing notions of causality. The minimal models from LP provide the default interpretation of sentences, leading to the typical nonmonotonic inferences that we find in subjects. Subjects hearing 'John was crossing the street' compute a minimal model in LP. In this model John is at some point reaching the other side. But if the sentence is followed by '... when a truck hit him', we expect a nonmonotonic recomputation of the model in which John does not reach the other side. This use of LP is the backdrop for much of the discussion in the reasoning book.

JWR. And can the process of seeking meaning in a reasoning task be described by such a logic?

MvL. Well, that is the holy grail. In the process of interpreting a reasoning task, subjects are indeed trying to complete some minimal model of all the input they receive. But they have to strike a subtle balance: deciding what words play key parts (syntax), what these words mean (semantics), and how the sentences in the task are suppose to relate (validity). Often subjects fail to reach a balance, and so, from an LP perspective, they fail to build up a satisfactory minimal model. Moreover, much of the interpretation process is influenced by the pragmatics of a task setup: if the experimenter has a high social status, for example, people are more likely to take sentences that she submits for testing as truths.

JWR. It looks like this will keep you busy for the rest of your academic career. Will it?

MvL. Remember that I already switched fields twice. I will cer-

tainly do that again. In fact, I am planning to writing a book about Kant's logic!

JWR. Why that?!

MvL. Kant's logic has a bad reputation among philosophers and logicians alike, as being an unimaginative version of traditional Aristotelian and Stoic logic as it is presented in the textbooks of his time. The Table of Judgements, on which the Table of the Categories is based, is usually not taken seriously from a logical point of view, which follows Frege in attributing to Kant a much too narrow view of judgement. But a closer look shows that Kant had genuine worries about the validity of logical laws and voices concerns that were taken up in the 20th century by so-called proof theoretic semantics, developed by Dummett and Prawitz. From this perspective, a considerable part of Kant's 'transcendental logic' can be fitted into logic proper. A view along these lines has been forcefully suggested by Batrice Longuenesse, in her *Kant and the capacity to judge*.

JWR. Does that not imply a major change of skills as well? You will need to do some genuine historical research, I suppose.

MvL. Of course I am helped by excellent studies on Kant, for example by Longuenesse. But I also believe that ideas of great philosophers can be meaningfully reinterpreted in a more modern setting, without staying true to the historical facts in all respects. In this case: if Kant had had the vocabulary of cognitive science and logic, he would have said this-or-that. I am looking to fill in the 'this-or-that' and then show that the result is highly relevant. I am not thereby trying to reconstruct Kant's own vocabulary. That project is rather like the so-called authentic interpretation of classical music. Of course you can try to make music sound exactly as it must have sounded in Beethoven's time, but that is not to say that Beethoven would not have been overjoyed by the possibilities of a Steinway grand piano.

How obvious is logic, really?

Consider the following:

All men are mortal.
Socrates is a man.
Therefore, Socrates is mortal.

Nothing seems more straightforward than the logical inference made in the above argument; indeed, if you are reading this article you have probably first seen it in an introductory logic class, and in many forms since then. Obviously, anyone with some sense immediately discerns the logical form of these premises; there's really no room for discussion. At least that's how it is presented. But how transparent is the logic of such an argument, really? I'll argue that it's not. In this brief article I'll suggest that arguments like these carry strong encultured ideas about the meaning of such sentences and their role in a logical argument, which make it transparent only through some rather special coloured lenses. What is obvious in logic class is by no means obvious outside of it.

Some of the cultural understanding required by such an argument becomes evident when interrogating people who haven't had the privilege of an education. Common responses from unschooled reasoners, when presented with a pair of premises containing a universally quantified premise and a particular one, are questions about the extent of the quantifier's domain, and the relation of the entity named in the particular premise to this domain. So, given the above premises, you might anticipate the retort, 'But Socrates is dead—he's not a man anymore' (or perhaps the admission that Socrates must be mortal because he's dead). Well, this is rather an academic fiction, since premises involving ancient Greek philosophers wouldn't go down so well with unschooled reasoners, but the pattern is true to empirical findings in this area. Luria's well-known research with peasants in Soviet Russia led him to con-

clude that subjects did not understand or respect the universal nature of the premises (1976: *Cognitive development: its cultural and social foundations*, HUP).

In fact, when the construction *all x* is used in spontaneous speech it is almost never operating on a universal domain, but rather on a severely constrained, contextually defined, sub-domain. Try it yourself—when you catch yourself using 'all' to quantify some entity you'll notice your domain is generally very small. Given this, concern about the position of any named entity in or outside the domain becomes legitimate. The question becomes: why are schooled subjects so comfortable with universally quantified sentences? Why did the argument I opened with seem so obvious?

In the given example several factors are working together to make the argument form accessible. Firstly, there's only one quantifier. Secondly, both premises are believable. But this ease of management we have with the given argument only extends to a small range of familiar argument forms. Add in another quantified premise, make the premises less believable, and you'll lose half your audience (as Oakhill et al. showed in their 1989 *Cognition* article). Combine two *different* quantifiers, such as *all* and *some . . . not*, and any trace of transparency is lost for the majority of subjects. The logical system is still there of course, but it's not as obvious—and now suddenly it becomes easier to imagine that discerning logical form involves practice, a learned ability of a particular way of looking at the sentences.

More surprisingly, take a sentence whose grammatical form is not as faithful to the predictable 'logic' of what's claimed, and educated subjects will choose the latter over the former. Fillenbaum showed this to great effect in his 1978 study of perverse threats and promises, in which subjects happily added or removed negations in supposedly logically equivalent paraphrases of the original sentences, the majority adamant they hadn't changed the meaning of the sentence in doing so ('How to do some things with IF', in the volume *Semantic factors in cognition*, Lawrence Erlbaum Associates). Fillenbaum's subjects converted such sentences as 'Clean up the mess or I won't report you' into sentences

such as 'If you don't clean up the mess I'll report you', thereby making a more typical threat of the sentence.

It seems that subjects exercise continuous discrimination in what is encoded into logical form and what not, from natural language contexts. Are they entitled to do this? Surely this is a sign of inconsistency, a lack of logical ability? This is where there has been a lack of communication between disciplines. Semanticists who study the logical structure of natural language know that this is perfectly legitimate. Natural language does not cleft neatly into 'logical' and 'non-logical' elements simply on the basis of grammar. Take the case of *only*. It may not strike one as 'logical' immediately. Yet *only* interacts with the focus of the sentence—determined by phonology—to fix the logical form of a stressed sentence. So for example, the following two sentences:

(a) Sarah only WRITES books.
(b) Sarah only writes BOOKS.

express different propositions: the first is true in situations where Sarah reads for instance magazines but no books, the second in situations where Sarah has quit her job as a gossip columnist. This is not mere pragmatic adjustment—we are talking here about truth-conditions of the expressed propositions. From an inferential point of view, from the first example we can conclude 'Sarah doesn't read books'; from the second the conclusion 'Sarah doesn't write newspaper columns' follows. A roughshod translation would encode the two sentences as having the same form (perhaps simply into p) since the grammar does not suggest any differing 'logical' aspect—we have to take phonology (or context) into account to see that—thereby losing these essentially logical differences between them.

We see that far from always being obvious, the logic of sentences is a multifaceted matter. Far from being described as doing the obvious, the classical logical reasoner can rather be described as interpreting the

premises in an artful way, involving the understanding that, given a certain setting, certain parameters of interpretation can be safely ignored, such as when subjects reason with a quantified statement on an underspecified domain. Next time you're tempted to think logic is obvious—remember all is not what it seems.

Marian Counihan
Philosophy, Amsterdam

Partial words and DNA strings

The bases constituting DNA molecules are adenine, thymine, guanine and cytosine. They are represented by the symbols *a, t, g, c*. Let us set $S_{DNA} = \{a, t, g, c\}$, the alphabet of DNA. The order of the bases is called the DNA sequence or DNA string. This sequence specifies the exact genetic instructions required to create a particular organism. A DNA sequence is represented symbolically as *attaacggtc*. If some mutation occurs and some positions become unknown then the string shall look like $at\diamond aac\diamond gtc$. This type of string is represented by partial word. The unknown positions, written as $\diamond$, form the *set of holes* of the partial word.

The comparison of genes motivated the notion of partial word (Berstel J. and Boasson L. 1999: Partial words and a theorem of Fine and Wilf, *Theoretical Computer Science*, 218, 135–141). Alignment of two genes can be viewed as construction of partial words. In the case of mutations or alignments of DNA sequences, some positions occur with the *do not know* situations. The punctured or holed DNA strings follow the properties of partial words. The various results regarding partial words are scattered in the literature of different subjects like theoretical computer science, DNA computing and combinatorics.

Partial words are defined as partial functions from the set of natural numbers to an alphabet. The holes of DNA partial words are studied to understand the biological point mutation. The *puncturedness coeffi-*

cient of a partial word is the ratio of the number of holes to the length of the partial word. This gives a measurement of the goodness of the partial word. *Periodicity* of a partial word is the repetition frequency of nucleotide bases. *Frequency ratio* is the ratio of the full word to the corresponding partial word. At a particular hole, the four nucleotide bases are assigned frequency ratios. The frequency ratios are obtained from some case study. Some function, such as maximum of the frequency ratios, determine the exact base at the desired position (Mazumdar D., 2008: *Proceedings of GAM*).

Words are important to any model of computing. The concept of partial words was first introduced in Berstel and Boasson's work (1999: 135–141). This work was to revisit a theorem of Fine and Wilf (1965: Uniqueness theorem for periodic functions, *Proceedings of the American Mathematical Society*, 16, 109–114). Berstel and Boasson extended some properties to partial words. But the main hindrance was that the results were confined to partial words with one hole. Some results failed when there were two or more holes.

To overcome the problem, Blanchet-Sadri and Hegstrom (2002: Partial words and a theorem of Fine and Wilf revisited, *Theoretical Computer Science*, 270(1/2), 401–419) revisited the landmarking work of Berstel and Boasson. They redefined the concepts and proved some new results. Later Blanchet-Sadri *et al.* proved some results regarding partial words with one hole, two holes, three holes and any number of holes. Most of the contributions to partial words are basically on periodicity. The partial words considered in these works have two periodicities.

Languages of partial words have been investigated in the works of Leupold (2004: Languages of partial words, *Grammars*, 7, 179–192). Some results on more than two periods are derived in the works Castelli M.G., Mignosi F. and Restivo A. (1999: Fine and Wilf's theorem for three periods and a generalization of Sturmian words, *Theoretical Computer Science*, 218, 83-94), Constantinescu S. and Ilie L. (2005: Generalized Fine and Wilfs theorem for arbitrary number of periods, *Theoretical Computer Science*, 339, 49–60), Shur A.M. and Konovalova

Y.V. (2001: On the periods of partial words, *Lecture Notes in Computer Science*, 2136, 657-665), Tijdeman R. and Zamboni L. (2003: Fine and Wilf words for any periods, *Indagationes Mathematicae*, 14, 135–147). Castelli M.G., Mignosi F. and Restivo A. (1999: 83-94) extended the theorem of Fine and Wilf to words having three periods.

Fine and Wilf's theorem states that if a word has two periods and its length is at least as long as the sum of the two periods minus their greatest common divisor, the word also has as period the greatest common divisor. Constantinescu and Ilie (2005: 49-60) generalized this result for an arbitrary number of periods and proved the optimality of the result.

A very basic problem in all DNA computations is finding a good encoding. The strands involved should not exhibit any undesired behaviour like forming secondary structures (Leupold P. 2005: Partial words for DNA coding, *Lecture Notes in Computer Science*, 3384, 224- 234). Various combinatorial properties like repetition-freeness and involution-freeness have been proposed to exclude such misbehaviour (Hussini S., Kari L. and Konstantinidis S. 2003: Coding properties of DNA languages, *Theoretical Computer Science*, 290, 1557–1579; Blanchet-Sadri F., Blair D.D. and Lewis R.V., 2006: Equations on partial words, *Lecture Notes in Computer Science*, 4162, 167–178; Leupold P., 2005: 224–234).

DNA partial words are represented by graphs (Blanchet-Sadri F. 2004: 71–82). The deformities or mutational effects of DNA are understood by studying the connectivity of the graphs. Partial words play a significant role in bioinformatics or computational biology. The computational literature primarily does not focus on this hole set. Various properties of the hole set can be explored with biological case studies (Mazumdar D. 2008). Partial words need more attention from the computational biology community.

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Can we consistently say that we cannot speak about everything?

In *In At Most One Thousand Words (The Reasoner 2(7))* I suggested that the paradoxical aspect of the definition:

(D) the least natural number not definable in English in at most one thousand words

could and should be avoided by denying that the implicit quantifiers in D can quantify over D itself.

A natural generalization of that suggestion is the claim that *no intensional object can quantify over itself*. The duality *intensional/extensional* is essentially the same as Frege's *Sinn/Bedeutung* distinction. For instance, a definition has an intensional content distinct from the object defined (if any), a concept/predicate's content is intensional as opposed to the multiplicity of the objects to which it applies, a proposition is intensional as opposed to its truth value, etc. Once this is clarified, we can express more formally our general claim as follows.

Let L be a language and let a model M be a pair $\langle \mathbf{U}^{M}, I^{M} \rangle$ where U^{M} is a universe of discourse and I^{M} an interpretation function assigning individuals in U^{M} to individual constants of L and subsets of U^{n} to n-ary predicates of L. Let j^{M} be a function assigning to each well-formed expression ϕ of L an intensional object associated with ϕ in accordance with M. That j^{M} yields *intensional objects* means again that $j^{M}(\phi)$ is, in each case, not an individual in U^{M} but its definition, not a subset of U^{M} but a concept/predicate applying to the members of a subset of U^{M}, not a truth value but a proposition about the members of U^{M}, etc. The principle is then expressed by the formula:

(Q) $\qquad j^{M}(\phi) \notin U^{M}$

As I see it, Q is the translation into logical terms of a phenomenological *eidetic* feature of all intentional acts: *no intentional act can be contained in its own intentional object*, restricted in Q to the cognitive ingredient of intentional acts.

It is an evident consequence of Q that no absolutely unrestricted quantification is possible and, consequently, that all domains of quantification or *universes of discourse* are extensible; briefly, that we cannot speak about *everything*.

This is also a consequence of the usual model theoretic principle that any non empty set is a legitimate quantification domain and that any such domain is a set. This principle rests on solid intuitive grounds, since the following double equivalence seems plausible:
[a multiplicity M is a completed totality (a set)] iff [its members can be taken as simultaneously given] iff [it is possible to simultaneously refer to all of its members].

Understandably, the claim that we cannot speak about *everything* has been deemed self-defeating if expressible and thus either inexpressible or false. Indeed, it seems to involve the same unrestricted quantification it is supposed to ban.

I attempt to confront here this difficulty.

I pick up a hint from Gödel. In his famous evaluation of Russell's Vicious Circle Principle (1944, p. 135, 136. "Russell's Mathematical Logic" in *The Philosophy of Bertrand Russell*, Schilpp ed. Northwestern University, Evanston, IL) he wrote:

> For, first of all one may, on good grounds, deny that reference to a totality necessarily implies reference to all single elements of it or, in other words, that "all" means the same as an infinite logical conjunction. One may, e.g., follow Langford's and Carnap's suggestion to interpret "all" as meaning analyticity or necessity or demonstrability. There are difficulties in this view; but there is no doubt that in this way the circularity of impredicative definitions disappears.

Carnap (e.g., in Carnap 1931, p. 51. "The Logicist Foundation of Mathematics" in *Philosophy of Mathematics*, Benacerraf and Putnam eds. Cambridge University Press, 1994) argued for the admissibility of certain impredicative definitions, for instance the definition of *inductive number* as any number possessing all the hereditary properties of zero:

$$Ind(x) =_{DF} (f)\,(Her(f) \cdot f(0) \supset f(x))$$

where

$$Her(f) =_{DF} (n)\,(f(n) \supset f(n+1))$$

One of the properties quantified over by '(f)' is precisely *being an inductive number*. So, how can we escape circularity in trying to ascertain, for instance, whether the number 2 is inductive? That is, whether:

$$(f)\,(Her(f) \cdot f(0) \supset f(2))$$

Carnap answers:

> If we had to examine every single property, an unbreakable circle would indeed result, for then we would run headlong against the property "inductive". (...) We do not establish specific generality by running through individual cases but by logically deriving certain properties from certain others. In our example, that the number two is inductive means that the property 'belonging to two' follows logically from the property 'being hereditary and belonging to zero'.

All this suggests that 'quantifying over' does not always mean 'referring to'. Quantification is not always extensional; the universal quantifier is sometimes used to mean an *intensional entailment between concepts/properties* and the logical necessity stemming from it. In these cases we can speak of an 'apparent quantifier' and we can always rephrase the quantified expression in order to replace the quantifier with an expression of *intensional entailment*.

For example, we usually say:
BIV) *all propositions are either true or false*
WF) *no set is self-membered*
although neither all propositions nor all sets seem capable of forming a universe of discourse. I suggest that what we really mean in such cases is something like:
BIV') *the concept of proposition implies the feature of being either true or false*
WF') *the concept of set implies the feature of being non self-membered*
Eliminating the apparent quantifier, the impossibility of absolutely unrestricted quantification can be intensionally expressed in this way:
the concept of universe of discourse implies the feature of being extensible.

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Horwich versus Tarski

Horwich's propositional Equivalence Schema and his associated theory of truth is an advance on the sentential tradition in which Tarski and his followers have worked. But, according to Horwich, there is the same, or at least a similar, problem with the Liar Paradox as bedevilled Tarski's theory. I show here that this is a misconception: a propositional account of truth is entirely clear of any self-referential paradox of the Liar kind.

Remember, first of all, the way we talk about sentences: by means of referring phrases like 'p', 'the sentence with Gödel number n', etc. By contrast, to refer to a proposition we use forms like 'that p', ('$\langle p \rangle$' in Horwich's terms) and 'what John proposed/believed', etc. Of course, with sentences we can easily get self-reference, i.e., we can easily construct a sentence J such that $J =$ '$\neg TJ$'. But Tarski's sentential Truth Schema, if applied within the same language, is: T'p' $\equiv p$. So that leads to the well-known Liar Paradox via the series of equivalences:

$\neg TJ \equiv \neg T\text{`}\neg TJ\text{'} \equiv \neg\neg TJ \equiv TJ$. But suppose we use Horwich's propositional Equivalence Schema instead, namely: $T\langle p\rangle \equiv p$. Then, obviously, we do not get a contradiction. We can say that $\neg TJ$, since now sentences do not have any truth-value. But $\neg TJ \equiv \neg T\text{`}\neg TJ\text{'}$, and not $\neg T\langle\neg TJ\rangle(\equiv TJ)$. It follows that the contradiction Tarski derived on the supposition of semantic closure within the same language arose through a category mistake, and specifically a use-mention confusion. If '$\neg TJ$' = $\langle\neg TJ\rangle$ then there would be a contradiction, but that would involve equating a mentioned sentence with a 'that'-clause.

There is a further, much more general argument, however, showing that no contradictions can arise on a propositional account of truth. That comes from noting, first of all, the following piece of grammar: $T\langle p\rangle \equiv$ That p is true $\equiv$ It is true that $p \equiv L^*p$. That is to say, Horwich's 'That p is true', while it is of the subject-predicate form, is equivalent to 'It is true that p', which is of an operator form. More specifically it involves the operator 'it is true that' which is the null or vacuous operator in the modal system KT. But one modal fact in KT is that if $L^*p \equiv p$ then it is not the case that $p \equiv \neg L^*p$, since KT is consistent. Furthermore, there is a quite general modal fact regarding all the 'L' operators in KT: $\neg L(p \equiv \neg Lp)$. So the conclusion must be that there are no paradoxical, self-referential propositions.

But how can it be that there are no paradoxical self-referential propositions? We can easily form a sentence J^* such that J^* = 'the proposition made by J^* is not true'. Horwich has considered another case of the form 'THE PROPOSITION EXPRESSED (BY THE SENTENCE) IN CAPITAL LETTERS IS NOT TRUE' (Horwich, P. 1998, *Truth*, 2nd Ed., Clarendon, Oxford, 41-2). So surely there must be a contradiction with these? Don't we get that $G = \langle\neg TG\rangle$ (for some 'G'), and therefore that $\neg TG \equiv \neg T\langle\neg TG\rangle \equiv TG$?

Anyone who thinks so is forgetting the possibility that no definite proposition is made in such cases, as there would be if the referring phrase ostensibly referring to a proposition was replaced by a non-descriptive demonstrative such as 'this' or 'that'. For then it would follow that the sentence on its own—outside some pragmatic use—would

not state anything definite to be not true. It follows from the supposed contradiction above, therefore, that in this place the definite description 'the proposition made by J^*' must be non-attributive, i.e., Millian. Likewise with Horwich's 'THE PROPOSITION EXPRESSED (BY THE SENTENCE) IN CAPITAL LETTERS'.

But what about the Fixed Point Theorem? It is provable in formal languages of sufficient complexity that, for any one-place predicate 'P' in the language there is a sentence 'p' such that $p \equiv P(\#\text{`}p\text{'})$, where $\#\text{`}p$' is the Gödel number of 'p'. So taking 'P' to be 'is not the Gödel number of a true sentence' a mathematically demonstrable case of paradoxical self-reference is obtained—assuming truth is taken to be a property of sentences. Cannot something similar be proved when truth is taken to be a property of propositions? Here one must remember Gödel's First Incompleteness Theorem, for instance, which showed that the undecidable formula '$(x)\neg Bew(x, g)$' must have non-standard interpretations, which means that this sentence may be used to express an unlimited number of propositions. Of course, at the more mundane level of natural languages, there are many sentences that can be used to make an unlimited number of propositions—those with normal indexicals in them, such as 'now', 'then', 'here', 'there', and the previous 'this', 'that'. But such indexicality has been deliberately excluded in formal languages, and that has meant that the distinction between sentences and the propositions they may be used to express has been largely lost, in the associated logical tradition. The result that Gödel proved, however, shows that a kind of indexicality is inescapable in languages that are sufficiently rich to accommodate a Gödel numbering of the sentences within them. And that shows that the categorical distinction between sentences and propositions has to be retained. More specifically, it means that, while the sentences in some language might be numbered, the propositions those sentences might be used to make are numberless. So there is no Fixed Point Theorem for propositions.

Hartley Slater
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§3
News

EUROCORES programme LogICCC—Modelling Intelligent Interaction. Logic in the Humanities, Social and Computational Sciences

Recent decades have seen major changes in the field of logic. Moving far beyond the traditional emphasis on philosophical argument, formal grammar or mathematical proof, modern logic has become a much richer inter-discipline which transcends the usual borderlines between academic 'cultures'.

Within the framework of logic, ideas from one discipline can effectively cross into another. E.g., it has been suggested that conversation can be modeled as computation, thus taking a paradigm from the physical sciences into the humanities. But by the same token, modern computation can be understood as conversation between different processors, in which case ideas from the humanities enter the computational sciences. At the same time there is a more societal dimension to this fundamental theory: enhancing rational communication is of eminent practical value in the world today, both in education and in the development of effective and human-oriented information technology.

A full analysis of these issues requires a common language and a framework which makes major structures visible across the humanities, social, computational and cognitive sciences and integrates them into comprehensive systems. Logic has played this role in the past for the foundations of the sciences, computation, and the semantics of natural

languages. The EUROCORES programme "LogICCC" is based on the firm conviction that present-day logic will continue to play this role in the much broader setting described here.

The EUROCORES programme "LogICCC–Modelling Intelligent Interaction: Logic in the Humanities, Social and Computational Sciences"—with a budget of 6.5 Million Euros supported by 13 national funding organizations—has invited researchers from a wide variety of disciplines to team up. Some of these researchers are logicians, others are not. But what all participants in LogICCC projects have in common is their interest in understanding interaction, pursued with the common language and models provided by logic in its modern, pluriform, and outward-looking guise.

Further information: http://www.esf.org/logic

THE LOGICCC PROJECTS

Computational Foundations of Social Choice (CFSC) CFSC will address some of the key issues in computational social choice, an interdisciplinary field of study at the interface of social choice theory and computer science. It aims at deepening our understanding of algorithmic and complexity-theoretic issues in social choice, at developing logic-based languages for modeling and reasoning about choice problems and preference structures, and at applying established techniques from AI, such as preference elicitation and learning, to problems of collective decision making.

Project Leader: Felix Brandt, University of Munich

Further information: http://www.tcs.ifi.lmu.de/~brandtf/cfsc.html

Dialogical Foundations of Semantics (DiFoS) Incorporating interaction and dialogue into logical semantics promises to overcome

certain shortcomings of more traditional static approaches. The DiFoS project aims to assess the foundational value of dialogue semantics and examine its potential to lay the foundations for logical reasoning in mathematics, computer science and linguistics. It will compare dialogical and game-theoretical semantics with inferentialist approaches, and also investigate the historical roots of dialogues in logic, especially within medieval theories of obligationes.

Project Leader: Peter Schroeder-Heister, Universität Tübingen

Further information: http://www-ls.informatik.uni-tuebingen.de/difos/

Games for Analysis and Synthesis of Interactive Computational Systems (GASICS) This project studies game theoretic formalizations of interactive complex computational systems and algorithms for their analysis and synthesis. Our goal is to overcome the limitations of the existing notions of games played on graphs, introduced by computer scientists, most of them being of the kind "two players-zero sum". We aim to extend them to "multiple players-nonzero sum" games, and show the applicability of the new theory to the analysis and synthesis of interactive computational systems.

Project Leader: Jean-François Raskin, Université Libre de Bruxelles

Further information: http://www.ulb.ac.be/di/gasics

The Logic of Causal and Probabilistic Reasoning in Uncertain Environments (LcpR) The project combines expertise from probability logic and nonmonotonic reasoning, probability and coherence, causality, conditional independence, models, human reasoning and empirical research on mental probability logic, counterfactuals and cognitive development.

It focuses on:

(i) foundational topics like rationality and evolution;

(ii) algorithms and implementation of local knowledge representation in non-graphical models (alternatives to Bayesian networks);

(iii) actual human reasoning in children and adults.

Project Leader: Gernot Kleiter, University of Salzburg

Further information: http://www.users.sbg.ac.at/~probnet/

Logic for Interaction (LINT) LINT is a collaborative research project aimed at developing mathematical foundations for interaction. Intelligent interaction involves agents in complex scenarios like conversation, teamwork, or games. Contours of a broad mathematical description are starting to emerge today, based on several individual research developments that now need to be brought together. LINT gathers logicians, computer scientists and philosophers from six European countries in an effort to lay the grounds for a unified account of the logic of interaction.

Project Leader: Dag Westerståhl, Göteborg University

Logical Models of Reasoning with Vague Information (LoMoReVi) Vagueness is a ubiquitous phenomenon pervading almost all forms of human interaction. This project focuses on logical aspects of processing vague information and aims at formal models that may serve as bridges between deductive fuzzy logics and various theories of vagueness. It also examines relations to other forms of imperfect information and connections to data extraction.

Project Leader: Christian Fermüller, Vienna University of Technology

SOCIAL SOFTWARE for elections, the allocation of tenders and coalition/alliance formation (SSEAC) All familiar election systems are known to have very bad properties and to yield counterintuitive results. The same holds for the allocation of tenders, resulting in many cases in court. In this project we want to study the topics mentioned above in the new framework recently introduced by Balinski and Laraki, avoiding the paradoxes. Making use of relational reasoning we will develop appropriate software.

Project Leader: José Luis Garcia Lapresta, Universidad de Valladolid

Vagueness, Approximation, and Granularity (VAAG) Vagueness is a pervasive property of human language and cognition. While vagueness has often been regarded as undesirable, the VAAG project is based on a growing recognition that vagueness is actually in many respects useful. The VAAG project targets a broad, interdisciplinary reassessment of vagueness with contributions to general cognitive science, linguistic semantics, experimental psychology, formal pragmatics and computer science.

Project Leader: Manfred Krifka, Zentrum für Allgemeine Sprachwissenschaft, Berlin

Further information: http://www.zas.gwz-berlin.de/research/projects/vaag/

Eva Hoogland
European Science Foundation

The Deontic Logic Wiki

Almost sixty years have already passed since deontic logic first entered the realm of modern logic with Von Wright (1951: Deontic Logic,

Mind, 1-15). In a nutshell, deontic logic concerns the formal analysis of normative concepts such as obligations, rights, permissions, and the study of the formal patterns typically involved in reasoning with such notions. Since its birth the field has quickly developed, fostered by the interaction of modal logic and philosophical disciplines typically interested in norms such as ethics and legal theory.

In 1991, deontic logic came "officially" in contact with computer science thanks to the 1st international conference of Deontic Logic in Computer Science (DEON'91), which was held in Amsterdam. Such encounters substantially increased the interdisciplinarity of the field, and since then the biannual DEON conferences have become a forum for the interaction of researchers coming from such different scientific backgrounds as logic, philosophy, legal theory, computer science and artificial intelligence.

What the researchers working on deontic logic still missed was the web analogue of the DEON conference, that is, a website that could serve as an active research tool for the community. With this aim in mind Leon van der Torre and Davide Grossi have launched the Deontic Logic Wiki, a website incorporating a database of people, events, publications (including comprehensive bibtex references), allowing the typical wiki functionalities which made sites like wikipedia so broadly used. The Deontic Logic Wiki has been presented on the occasion of the 9th International Conference on Deontic Logic in Computer Science (DEON'08), held at the University of Luxembourg from July 16th to 18th 2008, with the hope that it will become a stable reference for the field.

Davide Grossi
Computer Science, Luxembourg

Workshop on Logic, Language, Information and Computation, 1–4 July

WoLLIC (Workshop on Logic, Language, Information and Computation) is a series of annual international workshops where about two dozen researchers in pure and applied logic, selected by a stiff competition, meet to report and discuss their work, while leading figures in the field give invited lectures and tutorials. The centre of gravity of these workshops is in computing applications of logic, but many other areas are covered, ranging from mathematical proof theory to formal semantics of natural languages.

This year's workshop in Edinburgh was the 15th WoLLIC. There were seven invited speakers. Olivier Danvy presented an abstract machine which allows smooth and intuitive translations between different semantics in object-oriented programming. Anuj Dawar gave evidence that linear algebra can provide natural extensions of fixed-point logic with counting, which may shed light on the old problem of finding a logic that expresses exactly the polynomial-time computable properties of finite structures. Makoto Kanazawa described uniform and efficient algorithms for parsing in mildly context-sensitive languages, using Datalog queries and building on Earley magic sets. Sam Lomonaco introduced the main ideas of quantum computing, against a background of quantum measurement, quantum teleporting and quantum knot systems. Mark Steedman argued for a view of natural language semantics in which various expressions that have generally been taken as existential quantifiers should in fact be read as Skolem terms, and ambiguities in the supposed scopes of these quantifiers are in fact different readings projected from the lexicon as a result of different syntactic derivations. Henry Towsner reported recent proof-theoretic work in ergodic Ramsey theory, where the Gödel Dialectica interpretation interacts powerfully with more classical techniques. Nikolay Vereshchagin presented new results on notions of winnability for game semantics for affine and intuitionistic logics.

There were twenty-one contributed papers, from researchers in four-

teen different countries. These covered the following topics among others: uncertain reasoning, many-valued logic, fuzzy logic, variable-binders, the modelling of incomplete derivations, diagrammatic logics for reasoning about graphs, automata characterisations of conjunctive grammars, a recasting of possible world semantics to allow more distinctions between meanings, Skolem functions in linguistics, second-order monadic groupoidal quantifiers, the semantics of IF logic when nesting of quantifiers is allowed, logics of belief revision, logics for CCS programs, the power of memory logics, logics for specifying complex planning goals, domain-theoretic implementations of the Picard operator, measures of information content based on Kolmogorov complexity, infinitely-often one-way functions in cryptography, automated repair of inconsistent ontologies, quantum algorithms. There were special sessions on the functional interpretation of direct computations, and on how to write and review scientific papers. There was also a showing of George Csicsery's film 'Julia Robinson and Hilbert's Tenth Problem'.

Wilfrid Hodges
Mathematics, Queen Mary, University of London

Computation and Cognitive Science, 7–8 July

The conference, held at King's College, Cambridge, was lively: in place of formal presentations, all papers were pre-circulated to the participants, with each speaker speaking only briefly to introduce their paper, followed by a detailed one hour discussion. The discussions were spirited and constructive, and all delegates got involved.

William Bechtel (UCSD) opened the conference by arguing that cognitive science is moving away from a tradition of computational 'modelling-first' strategies to 'decomposition-first' strategies, where the decomposition is primarily structural rather than functional, as illustrated by recent work on circadian rhythms.

Kenneth Aizawa (Centenary College) argued that traditional notions

of computation in terms of Turing-equivalence do not do justice to the practice of cognitive neuroscience, or to the history of the way in which the concept entered the sciences. The notion of computation has the rhetorical flourish of a 'high value concept', but its content takes radically different forms in different sciences.

Frances Egan (Rutgers) argued for a deflationary way of understanding mental content: it is a purely heuristic gloss in syntactic accounts in cognitive science. She used this to defend Chomsky's view that talk of representation is dispensable in cognitive science, but also to explain why we still feel drawn to employ it.

Chris Eliasmith (Waterloo) argued that the best way of understanding computation in the brain is in terms of non-linear control theory. Control theory is more explanatory, predictive, and better suited to manipulation than its main rivals: traditional computation theory, dynamical systems theory, and statistical models.

Gualtiero Piccinini (University of Missouri, St. Louis) argued that notions of information processing are often confused with notions of computation. Various notions of information (Shannon, natural, non-natural) criss-cross with notions of computation (digital, generic, semantic, non-semantic), and should be carefully distinguished.

Richard Samuels (Ohio State) argued that the frame problem facing central cognitive processes should not rule out an account of those processes in terms of a classical computational theory of mind. The frame problem should be distinguished from problems involving relevance and holism, but none are obviously insurmountable to a classical model.

Oron Shagrir (Hebrew University) argued that the notion of computation deployed in cognitive neuroscience is best understood as a species of analogue computation. Relations between computational states should mirror the relations between the features in the world that those states represent.

Mark Sprevak (King's College, Cambridge) argued that the possession of representational content is a necessary condition on any process counting as a computation. Contra purely syntactic and functional ac-

counts of computation, a computational description is a semantic description, and its semantic content may include abstract entities like numbers, as well as distal content.

Daniel Weiskopf (South Florida) argued that recent attempts to reduce linguistic understanding to manipulations of a common sensorimotor computational code in embodied cognition can and should be resisted.

A forthcoming special issue of *Studies in History and Philosophy of Science* is devoted to the papers. PDFs of drafts of the papers, and full details of the conference, are available from the conference website.

Mark Sprevak
King's College, Cambridge

Sixth Bayesian Modelling Applications Workshop, 9 July

The Bayesian Modelling Applications Workshop provides a forum for exchanging research questions and insights, methodologies, techniques, and experiences with applications of Bayesian models to various problem domains. The sixth edition took place in Helsinki, Finland, on July 9 and had 'bias' as a special theme.

The two morning sessions addressed bias in model elicitation, with a focus on probabilities in the first session. Colette Thomas (*Observations from field trials with several elicitation techniques in an ecological domain*) presented experiences with five techniques for probability elicitation, identifying some problems and concluding that, once used to assessing probabilities, her expert subjects preferred a matrix format. In the second presentation, Bram Wisse (*Relieving the elicitation burden of Bayesian Belief Networks*) presented the EBBN method, which can be viewed as a canonical model for general discrete variables and an alternative for noisy-MAX. Not being able to model synergistic effects was identified as being a potential problem, not only in the EBBN

method, but also for the approaches presented in the first two papers of the second session.

No 'explaining away', was the reason given by Hannes Wettig (*A Bayesian approach to learning in fault isolation*) for why their models, trained and performing well on single faults, were unable to detect multiple faults occurring in trucks. In practice no problem however: other faults will be detected in the workshop when the truck is sent off for repair. Explaining away competing hypotheses will be the next step in extending the HMF approach presented by Sicco Pier van Gosliga (*Hypothesis Management Framework: a flexible design pattern for belief networks in decision support systems*). The HMF framework is intended as a practical tool in situations where multiple users work with evolving models, for example in the context of criminal investigations. Whether network construction is made more easy using a CIM-enabled interface was investigated and presented by Mike Farry (*An experimental procedure for evaluating user-centered methods for rapid Bayesian network construction*) who demonstrated the problems users have to distinguish between evidence and belief, and the effects of positive and negative phrasing upon creation and interpretation of models.

In the afternoon, Marek Druzdzel (*The impact of overconfidence bias on practical accuracy of Bayesian network models: an empirical study*) showed how the effects of systematic bias can be studied. He concluded that underconfidence has a serious effect on accuracy, more so than random noise; overconfidence, often displayed by humans, seems to have only a minor effect on accuracy. Different approaches for explicitly capturing known bias were presented by Eric Carlson (*Methods for representing bias in Bayesian networks*), who argued that sometimes making known bias explicit is more insightful than correcting for it. The afternoon also found Adnan Darwiche and Rina Dechter presenting the results of a probabilistic inference evaluation held prior to the workshop.

All in all it was an interesting day and all papers presented can be found in the online proceedings, or through the workshop's website.

Silja Renooij
Information and Computing Sciences, Utrecht

Third International Conference on Interdisciplinary Social Sciences, 22–25 July

Blessed by cooler weather than is usual for Tuscany in the summer, the Third International Conference on Interdisciplinary Social Sciences took place at the Monash University Centre in Prato's Palazzo Vaj (an historic structure without air conditioning) from 22 to 25 July, 2008. Almost 400 delegates from 32 countries attended the meeting to present their work in parallel sessions and listen to plenary addresses from Laurie Johnson (University of Southern Queensland), Michael Neocosmos (Global Movements Program, Monash South Africa), Leela Fernandes (Rutgers University, New Brunswick, New Jersey), Jan Nederveen Pieterse (University of Illinois, Urbana-Champaign), Barclay Hudson (Fielding Graduate University, California), and Constantine Skordoulis (University of Athens, Greece), whose paper was read by Eugenia Arvanitis of the Greek Ministry of Education.

Johnson's talk was entitled 'Ill Disciplined (Bodies of Thought)' and reported on an instance of disciplinary boundary crossing that prompted a deeper look at the meaning of an old and unresolvable philosophical issue. Neocosmos spoke on 'Rethinking the Post-Developmental State in Africa Today,' suggesting that politics is distinct from and transcends policies. Fernandes' talk was entitled 'Ethics, Politics and Transnational Feminist Knowledge: Regimes of Visibility and Invisible Practices.' She offered an analysis of transnational feminist scholarship that proposed 'a broader methodological approach that can address three dimensions of knowledge production: epistemological..., ontological... and the ethical.... By focusing on these questions in terms of methodology my intention is to approach knowledge as a set of practices that can be both deconstructive and constructive and move be-

yond more static discussions of power/knowledge.' Professor Pieterse led his audience on a grand tour of contemporary globalism and the emerging field of global studies that seeks to understand it. Barclay in his turn reminded us of the historian Ibn Khaldun (1332-1406), whose grasp of historiography and the rise and fall of civilizations can show us a thing or two today, perhaps muting our smugness. Under the title 'Space Conceptualisation in the Context of Postmodernity: In Search of a Cultural Logic' Skourdoulis' paper encouraged social scientists to rethink their use of space as a metaphor for representing the postmodern era. Rather than remain trapped in the contradiction of substantive and relational space, we would do better to study the various forms of spatial representation.

Some of the lively coffee-break conversation concerned the importance of bringing the scholarship of interdisciplinarity into the foreground. This conference gathered together knowledge workers from many domains of social science, yet simply bringing the disciplines together does not create actual interdisciplinary work. It is likely that next year's International Conference on Interdisciplinary Social Sciences will begin with some explicit examination of interdisciplinarity, its nature and challenges.

The closing plenary session of the conference was devoted to a sharing by 'talking circle' groups who in the preceding 45 minutes had been reflecting on their experience at the conference and the themes and ideas that emerged. Central among the discussion was the sense that there had been a spirit of mutual support and collaboration. People made personal connections. Scholarly work need not be cold and abstract with such relationships. The scope and scale of the work discussed at the conference was open.

Next year's conference will be held in Athens—details here.

Homer (Tony) Stavely
Common Ground Publishing

What (Good) is Historical Epistemology? 24–26 July

The title question of the conference held at the Max Planck Institute for the History of Science (Berlin) was primarily framed by the organizers (Uljana Feest and Thomas Sturm) in order to clarify certain topical relationships; namely, what *good* has historical epistemology (HE) been for historiographical concerns within the history of science? What *good* has HE been as a possible contributor to the history of epistemology? And finally, can HE be of any good to traditional epistemological concerns, such as the nature of justification and belief? The conference, all in all, aimed at presenting various available conceptions of HE to a philosophical audience that has up to now often neglected it.

After three intensive days and about twenty-one presentations by philosophers, historians, and sociologists (and various combinations thereof), and many lively discussions, what became clearer were many possible answers, approaches and interpretations to the title and associated questions. It would be impossible to present all these here, but some key aspects should suffice to give an impression of this important event. Before we begin, it might be of interest to note some of the more prominent participants of the conference: Lorraine Daston, Daniel Garber, Michael Friedman, Philip Kitcher, Martin Kusch, Sandra Mitchell, Jürgen Renn, Hans-Jörg Rheinberger, Robert J. Richards, Barry Stroud, Catherine Wilson and M. Norton Wise. The number of audience members came to nearly one-hundred and twenty.

Generally speaking, some seemed to approach the main question by contrasting HE to what it may not be; namely to things like history of epistemology, history of knowledge practices, and the philosopher's reconstructive history. Along with Thomas Sturm's (Berlin) paper, Lorraine Daston's (Berlin) characterization of HE, for instance, was a good example of this approach. She suggested that HE be understood as standing in a continuum between the history of knowledge practices and the history of epistemology; where HE examines the emergence and articulation of novel epistemological categories and problems in the sciences out of knowledge practices. Dan Garber (Princeton), however,

seemed to feel by the end that none of these should be distinguished from HE, and both Hans-Jörg Rheinberger (Berlin) and Jean François Braunstein (Paris) reminded us of the contingent nature of these distinctions, especially upon language, national traditions and discipline formation.

Another approach to the question was to relate HE to traditional philosophical epistemology, which became, more specifically, the question: what good is *history* to epistemology? In the main, there seemed to be two ways in which this was answered: by either expanding the traditional notion of epistemology, or by showing how history may be included into its traditional task. Uljana Feest (Berlin) provided an instance of the former. In answering her question—what kind of HE is provided by studying "epistemic objects"?—she claimed that unlike the concern of the philosopher of science with justification of theory and results, her focus was rather the norms of the concepts used in experimental design; in other words, the focus is on the process rather than the justification of results. Barry Stroud (Berkeley), in contrast, provided a good example of the latter, in suggesting that history might come into play as a 'diagnostic' to a stalemate between divergent solutions to a traditional epistemological problem. This came also close to Philip Kitcher's (New York) keynote address, where he suggested that the epistemologist should actually enter the 'historical laboratory,' which may possibly help her not only to resolve difficult cases in philosophy, but also to historically answer a traditional epistemological question: how do you identify good methods for changing beliefs? Along with Michael Heidelberger (Tübingen) and Sandra Mitchell (Pittsburgh), Kitcher's address attempted to combine HE with another approach to epistemology, naturalism. In making such a connection, they were actually advancing a new version of HE. It remains to be seen, as Michael Friedman (Stanford) noted in discussion, whether such a task is a coherent one, considering that notions like 'knowledge' and 'object' may not be treated in the same way as 'organisms', for instance, are in science.

Due largely to the philosophical tenor of these issues the inverse

problem—what good is *epistemology* to history?—was discussed far less; but when it was, what became evident was that the historian's conception of epistemology seemed much broader than traditional philosophical conceptions. Where the two—philosophical approaches to HE and those in the history of science—may have converged was in their mutual recognition in the importance of identifying where, historically, epistemological questions come from. Apart from these two approaches, I can only mention Martin Kusch's (Cambridge) three historiographical desiderata for any HE, and Hasok Chang's (London) memorable paper, which advanced a kind of 'activist' approach to reviving 'killed' scientific entities in light of his notion that even such entities embody (scientific?) knowledge.

Omar W. Nasim
History of Art, Florence
History of Science, Berlin

First Formal Epistemology Festival, 28–30 July

The background for the first Formal Epistemology Festival on Conditionals and Ranking Functions in Konstanz, Germany, was the 40th anniversary of Robert Stalnaker's *A Theory of Conditionals* and the 20th anniversary of Wolfgang Spohn's *Ordinal Conditional Functions. A Dynamic Theory of Epistemic States.* Besides the organizers Franz Huber, Eric Swanson, and Jonathan Weisberg, the other speakers were Igor Douven, David Etlin, Anthony Gillies, Alan Hájek, Hannes Leitgeb, Sarah Moss, Hans Rott, Wolfgang Spohn, Robert Stalnaker, Robert Williams, and Timothy Williamson. We will summarize four of the talks.

Robert Stalnaker opened the festival with his talk *Nested Conditionals and Iterated Belief Revision*. He drew a comparison between the iteration of modal operators and iterated belief revision. The former was accounted for by Kripke-style accessibility relations. To account for

the latter, Stalnaker argued that we have to add structure to the belief model. This can partly be done by using conditionals to represent belief revision policies and thereby making belief dynamics explicit. We also have to understand the input as including meta-information. Stalnaker gave examples that showed that sometimes new information does not yield a change of our beliefs in atomic propositions, but a change of our belief revision behavior and thereby a change of our beliefs about conditionals.

Wolfgang Spohn's talk *Objectivizing Ranking Functions* explained the extent to which ranking functions that describe subjective doxastic states, i.e. subjective grades of disbelief, can be objectively true or false. The basic idea is to uniquely associate propositions that can be true or false with how a given feature is realized in a ranking function and then to uniquely reconstruct the functions from these associated propositions. This works sometimes, and sometimes it does not. The most exciting positive example is direct causation, which can be an objective notion even though its basic explication is a subjective one via ranking functions.

In his talk *Conditionals and Actuality*, Timothy Williamson explored the possibilities for adding a connective for indicative conditionals to a formal language containing an actuality operator. For this, he set up a number of plausible assumptions including an axiom for the actuality operator for an otherwise unspecified propositional language. He then showed that if reflexivity and distribution hold for the indicative conditional, a number of unintuitive consequences arise, since the indicative conditional must then behave like the material conditional in a wide range of cases.

Alan Hájek's talk *Arrows and Haloes: Probabilities of Conditionals and Desire as Belief* focused on the similarities between the debates about the thesis that probabilities of conditionals are conditional probabilities, and about the thesis that the extent to which we desire a proposition to be the case is equal to our degree of belief in the goodness of this proposition. Central to both debates are the triviality results of Lewis. But these results can be avoided in both cases by adopting indexical in-

terpretations of the conditional and the goodness operator, respectively. Hájek discussed further objections and stressed the importance of an exchange between the debates.

The festival was the first of a series of small and thematically focused events in formal epistemology. The festivities of 2009 in Ann Arbor will feature Causal Decision Theory and Scoring Rules; the festivities of 2010 in Toronto will focus on Defeater/Default Logic and Perception.

Peter Fritz, Robert Michels, Maryia Ramanava, Alexandra Zinke
Philosophy, Konstanz

European Summer School on Logic, Language and Information, 4–15 August

Should you wonder what logicians, linguists, and computer scientists do over the summer, go to the European Summer School for Logic, Language, and Information (ESSLLI) and find out all about it. Every year this event brings together a large community of researchers, both graduate students and teachers, from various fields related to reasoning.

The 20th ESSLLI was held at the University of Hamburg, and jointly organised by a local organising team and some staff members from the Institute for Logic, Language, and Information. In about 50 courses of five lectures each, spanning two weeks in total, roughly 500 graduate students from 47 different countries were provided with thorough introductions and state of the art overviews of a large variety of research fields. A veritable feast for the reasoner.

Clearly, it is impossible even to begin with an overview of the courses offered at ESSLLI. One course is discussed in the interview of this Reasoner. To give an idea, other courses were given by Paul Égre and Mikaël Cozic on 'Introduction to the Logic of Conditionals', by Eric Pacuit and Olivier Roy on 'Reasoning, games, action, and rationality', by Jan Reimann on 'Randomness', by Hans-Christian Schmitz and

Henk Zeevat on 'Formal and experimental approaches to discourse particles and modal adverbs', by Jouko Väänänen on 'Dependence Logic', by Jon Williamson and your reporter on 'Probabilistic Logics and Probabilistic Networks', and by Jelle Zuidema on introduced 'Grammar induction and language evolution'. But this is just one selection, and an admittedly biased one, from the many courses on offer.

One of the special qualities of ESSLLI is that it brings together so many different disciplines and researchers, who can find out about neighbouring fields, or even fields far away, in an informal and efficient way. For graduate students in particular, it is the perfect shopping centre for ideas and new developments. So if you are a logician, linguist, or computer scientist and wonder what to do next summer, go to ESSLLI.

Jan-Willem Romeijn
Philosophy, Groningen

Calls for Papers

Psychology and Experimental Philosophy: Special issue of the European Review of Philosophy, deadline 1 September.

Dependence Issues in Knowledge-Based Systems: Special Issue of International Journal of Approximate Reasoning, deadline 15 September.

VLDB: Journal Special Issue on Uncertain and Probabilistic Databases, 15 September.

Humana.mente: Volume 8, Models of Time, 15 November.

Sir Karl Popper Essay Prize: British Society for the Philosophy of Science, deadline 31 December.

Reasoning for change: Special issue of the journal Informal Logic that will address the relationship of reasoning and argumentation to political change and progress, 10 February.

§4
Introducing …

In this section we introduce a selection of key terms, texts and authors connected with reasoning. Entries will be collected in a volume *Key Terms in Logic*, to be published by Continuum. If you would like to contribute, please click here for more information. If you have feedback concerning any of the items printed here, please email thereasoner@kent.ac.uk with your comments.

Antinomy

A pair of contradictory propositions, each of which can be demonstrated from a valid deductive proof, thereby giving rise to a contradiction or paradox. Paradigmatic examples appear in law and jurisprudence, where two legal judgments, standing as mutually exclusive and mutually exhaustive alternatives, are both justified by the same law (or set of laws). As a philosophical term, 'antinomy' receives perhaps its most extensive development in the critical works of Kant. In the Critique of Pure Reason, for example, Kant outlines four 'cosmological antinomies' that deal with the structure of the universe (or world-whole), the divisibility of matter, causality, and the existence of God. According to Kant, the 'dialectical opposition' between the 'thesis' and 'antithesis' of these antinomies results from reason's attempt to transcend the limits of possible experience. Other German Idealists, such as Fichte and Hegel, also develop the term in a philosophical sense. More recently, however, in the works of twentieth century analytic philosophers, such as Russell, Ramsey, and Quine, the term 'antinomy' is more narrowly applied to problems of logic and mathematics (including, but not limited to, paradoxes of infinity and paradoxes involving part-whole relationships).

Matt Hettche
Philosophy, Auburn University

Lewis, David Kellogg

Lewis (1941-2001) was an eminent, versatile and prolific American philosopher.

Lewis (1973: *Counterfactuals*, Blackwell) offers a semantics for counterfactual conditionals. On the account of Robert Stalnaker (1968: 'A Theory of Conditionals' in Nicholas Rescher (ed.), *Studies in Logical Theory*, Blackwell, 98–112), a counterfactual conditional is true if in the possible world most similar to the actual world in which the antecedent is true, the consequent is true. For example, 'If I had asked Elaine to marry me she would have refused' is true if among those possible worlds in which I did ask Elaine to marry me the possible world most similar to the actual world is one in which she refused.

In addressing de re modality, Lewis (1973, 39-43; 1986: *On the Plurality of Worlds*, Blackwell) invokes 'counterpart theory'. I am not agnostic, but, according to Lewis, I might have been since there is another possible world in which there is a counterpart of me who is in fact agnostic. Counterparthood is a relation of similarity rather than identity: I exist only in the actual world. Our example counterfactual is true at the actual world, w^*, if there is a world, j, closely similar to w^*, in which my counterpart asks Elaine's counterpart to marry him and she refuses and there is no world, k, such that k is at least as similar to w^* as is j and at k my counterpart proposes to Elaine's counterpart and she does not refuse (after 1973: 42). Lewis (1986) defends counterpart theory, realism about possible worlds and the view that modal operators are quantifiers over possible worlds.

Lewis (1991: *Parts of Classes*, Blackwell) provides an original contribution to the philosophy of set theory.

Stephen McLeod
Philosophy, Liverpool

§5
Events

September

IVA: The Eighth International Conference on Intelligent Virtual Agents, Tokyo, 1–3 September.

Grandeur of Reason: Rome, 1–4 September.

ECCBR: 9th European Conference on Case-Based Reasoning, Trier Germany, 1–4 September.

10th Asian Logic Conference: Kobe University, Japan, 1–6 September.

COMSOC: 2nd International Workshop on Computational Social Choice, Liverpool, 3–5 September.

KES: 12th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems, Zagreb, 3–5 September.

Phlox Workshop: Launch workshop on current issues in metaphysics and the philosophy of language, 3–5 September.

ICANN: 18th International Conference on Artificial Neural Networks, Prague, 3–6 September.

BLC: British Logic Colloquium, Nottingham, 4–6 September.

Naturalism: Kazimierz Naturalism Workshop, Kazimierz Dolny, Poland, 6–10 September.

SMPS: Soft Methods for Probability and Statistics, 4th International Conference, Toulouse, 8–10 September.

AiML: Advances in Modal Logic, LORIA, Nancy, France, 9–12 September.

Causality and Probability in the Sciences

University of Kent, Canterbury UK, 10–12 September

Colloquium Logicum: The biennial meeting of the German Society for Mathematical Logic, Technische Universitaet Darmstadt, 10–12 September.

Logic of Change, Change of Logic: Prague, 10–14 September.

MAS&BIO: MultiAgent Systems & Bioinformatics 2008, Cagliari, Italy, 13 September.

NMR: Twelfth International Workshop on Non-Monotonic Reasoning, Special Session on Foundations of NMR and Uncertainty, Sydney, 13–15 September.

ICAPS: International Conference on Automated Planning and Scheduling, Sydney, 14–18 September.

ECML PKDD: The European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, Antwerp, Belgium, 15–19 September.

Spatial Cognition: Schloss Reinach, Freiburg, 15–19 September.

CSL: 17th Annual Conference of the European Association for Computer Science Logic, Bertinoro, Italy, 15–20 September.

PGM: The fourth European Workshop on Probabilistic Graphical Models, Aalborg, Denmark, 16–19 September.

KRAMAS: Workshop on Knowledge Representation for Agents and Multi-Agent Systems, Sydney, 16–19 September.

Mathematical Methods in Philosophy: School of Mathematics, University of Bristol, 19–21 September.

Biotechnology, Past, Present & Future: The Genentech Center for the History of Molecular Biology and Biotechnology at Cold Spring Harbor Laboratory, 21–23 September.

HAIS: 3rd International Workshop on Hybrid Artificial Intelligence Systems, Burgos, Spain, 24–26 September.

Ontology, mind and language: VIII SIFA National conference, Bergamo, Italy, 25–27 September.

CLIMA-IX: 9th International Workshop on Computational Logic in Multi-Agent Systems, Dresden, Germany, 29–30 September.

October

SUM: Second International Conference on Scalable Uncertainty Management, Naples, 1–3 October.

SETN: 5th Hellenic Conference on Artificial Intelligence, Syros, Greece, 2–4 October.

Reason, Activism, and Change: University of Windsor, 3–5 October.

Formal Modeling in Social Epistemology: Tilburg Center for Logic and Philosophy of Science, 9–10 October.

ICAI: The 1st International Conference on Advanced Intelligence, Beijing, 19–22 October.

FotFS VII: Bringing together Philosophy and Sociology of Science, Foundations of the Formal Sciences VII, Vrije Universiteit Brussel, 21–24 October.

Uncertainty Reasoning for the Semantic Web: 4th International Workshop, in conjunction with the 7th International Semantic Web Conference, Karlsruhe, Germany, 26 October.

MICAI: 7th Mexican International Conference on Artificial Intelligence, Mexico City, 27–31 October.

MDAI: Modeling Decisions for Artificial Intelligence, Barcelona, 30–31 October.

November

Peter Lipton Memorial Conference: Department of History and Philosophy of Science, Cambridge, 1 November.

LNAT: Logic Now and Then, The Center for Research in Syntax, Semantics and Phonology (CRISSP), Brussels, 5–7 November.

Automated Scientific Discovery: AAAI Fall Symposium, Arlington, Virginia, 7–9 November.

WPE: Workshop on Philosophy and Engineering, The Royal Academy of Engineering, Carlton House Terrace, London, 10–12 November.

Health in context: A short course in multilevel modelling for public health and health services research, Universidade Nova de Lisboa, Lisbon, Portugal, 10–14 November.

Nature and Structure: Philosophy of Physics Graduate Student Conference, SUNY at Buffalo, 15 November.

Propositions: Ontology, Semantics, and Pragmatics: Venice, Italy, 17–19 November.

Physics Meets Biology:: Perspectives from Philosophy, History, and Science, Royal Society of Edinburgh, 18–20 November.

Game Theory: 5th Pan-Pacific Conference in Game Theory, Auckland, 19–21 November.

December

Inference, Consequence, and Meaning: Sofia, 3–4 December.

ICLP: 24th International Conference on Logic Programming, Udine, Italy, 9–13 December.

CIMCA: International Conference on Computational Intelligence for Modelling, Control and Automation, Vienna, Austria, 10–12 December.

Trends in Logic VI: Logic and the foundations of physics: space, time and quanta, Brussels, Belgium, 11–12 December.

ICDM: 8th IEEE International Conference on Data Mining, Pisa, 15–19 December.

PRICAI: Tenth Pacific Rim International Conference on Artificial Intelligence, Hanoi, Vietnam, 15–19 December.

January 2009

LFCS: Symposium on logical foundations of computer science, Deerfield Beach, Florida, 3–6 January.

SODA: ACM-SIAM Symposium on Discrete Algorithms, New York Marriott Downtown, 4–6 January.

Biomolecular Networks: from analysis to synthesis, Pacific Symposium on Biocomputing, Fairmont Orchid, The Big Island of Hawaii, 5–9 January.

3rd Indian Conference on Logic and its Application: The Institute of Mathematical Sciences, Chennai, India, 7–11 January.

VAF 2009: 3th Conference of Dutch Flemisch Association for Analytical Philosophy, Tilburg University, the Netherlands, 22–23 January.

Bayesian Biostatistics: Houston, Texas, 26–28 January.

February

ACM International Conference on Intelligent User Interfaces: Sanibel Island, Florida, 8–11 February.

AIA: IASTED International Conference on Artificial Intelligence and Applications, Innsbruck, Austria, 16–18 February.

March

Models and Simulations 3: Charlottesville, Virginia, 3–5 March.

ADS'09: Agent-Directed Simulation Symposium, Part of the 2009 Spring Simulation Multiconference, San Diego, California, 22–27 March.

CSIE 2009: 2009 World Congress on Computer Science and Information Engineering, Los Angeles/Anaheim, 31 March–2 April.

April

Foundations of Math: New York University, 3–5 April.

EuroGP: 12th European Conference on Genetic Programming, Tübingen, Germany, 15–17 April.

AISTATS: Twelfth International Conference on Artificial Intelligence and Statistics, Clearwater, Florida USA, 16–19 April.

May

AAMAS: The Eighth International Joint Conference on Autonomous Agents and Multi-Agent Systems, Budapest, Hungary, 11–15 May.

Philosophy and Cognitive Science: The XIXth edition of the Inter-University Workshop, Zaragoza, 18–19 May.

UR: Uncertain Reasoning, Special Track of FLAIRS, Island, Florida, USA, 19–21 May.

June

Argument Cultures: Ontario Society for the Study of Argumentation, Windsor, Canada, 3–6 June.

NA-CAP: Networks and Their Philosophical Implications, Indiana University in Bloomington, 14–16 June.

§6
Jobs

Post-doc position: 5-year postdoc position in Mathematical Logic in Lisbon, 10 September.

10 post-doctoral fellowships: University of Sydney Postdoctoral Research Fellowships 2009, 12 September.

Post-doc position: Graphical probabilistic models for reliability, University of Luxembourg, 15 September.

Tenured Professorship in Theoretical Philosophy: University of Cologne, deadline 26 September.

Assistant Professor: Philosophy of science and technology, University of North Texas, deadline 1 October.

§7
Courses and Studentships

Courses

MSc in Mathematical Logic and the Theory of Computation: Mathematics, University of Manchester.

MA in Reasoning

An interdisciplinary programme at the University of Kent, Canterbury, UK. Core modules on logical, causal, probabilistic, scientific and mathematical reasoning and further modules from Philosophy, Psychology, Computing, Statistics and Law.

MSc in Cognitive & Decision Sciences: Psychology, University College London.

Causality Study Fortnight

University of Kent, Canterbury UK, 8–19 September

Physics and Metaphysics: XIth Summer School on Philosophy of Physics, Cesena, 15–20 September.

Mind as Machine: Department for Continuing Education, University of Oxford, 1–2 November.

Philosophy of Psychology: Bochum / Tilburg, First European Graduate School, Philosophy of Language, Mind and Science, 10–21 November.

Summer Institute on Argumentation: University of Windsor, Canada, contact H.V. Hansen or C.W. Tindale, 25 May – 6 June, 2009.

Studentships

PhD Position: Formal Epistemology Research Group, University of Konstanz, deadline 30 September.